



Northern Climate ExChange

Independent Information - Shared Understanding - Action on Climate Change

NCE Update February 3, 2010



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Announcements

- 3. TONIGHT: Adaptation and Activism: Climate Change Lecture Series**
- What really happened in Copenhagen

The **Northern Climate ExChange, Yukon College** in association with the **MacBride Museum of Yukon History** will be hosting a series of speakers to present talks on Climate Change. This will provide an opportunity for the public to learn about climate change research and related work through informal yet informative lectures.

The '**Adaptation and Activism: Climate Change Lecture Series**' will run every Wednesday night from **7:00 - 8:00 pm at the McBride Museum** from **February 3rd until March 3rd 2010**.

- **February 3 - Amber Church: What really happened in Copenhagen**
- **February 10:** Bruce Bennett - Climate change and Invasive Species
- **February 17:** Karine Grenier - Climate Change and Northern Life - Views from an Environmental Historian
- **February 24:** Vicki Sahanatien - Polar Bears, Sea Ice and Climate Change
- **March 3:** Meghan Larivee - Coping with a Changing World: Adaptation and Plasticity in Kluane Red Squirrels



To view bios of presenters and descriptions of the lectures please visit McBride's website at: www.macbridemuseum.com

For more information please contact Meghan Larivee, NCE Communication and Outreach Coordinator, at 456-8694 or mlarivee@yukoncollege.yk.ca.

4. CBC 'Doc Zone' - *Carbon Hunters* (Feb 7)

"**Doc Zone** presents the World Premiere of a timely and intriguing new documentary by **Vancouver filmmaker/journalist Miro Cernetig, *Carbon Hunters***.

Carbon Hunters delves into the controversial, little-understood, yet booming industry of carbon credit trading as a potentially workable mechanism towards solving what most people now acknowledge as the greatest crisis facing the planet: global warming.

Carbon Hunters is produced by [Force Four Entertainment](#) in association with the Canadian Broadcasting Corporation".

Sunday February 7, 2010 at 11 pm on CBC TV

[View trailer here.](#)

www.cbc.ca

1. Energy Solutions Centre: Northern Energy Solutions Conference: Practical and Current Energy Solutions for the North - February 2010

The **Energy Solutions Centre** will host the **Northern Energy Solutions Conference** on February 15 - 19, 2010 at the Yukon Inn in Whitehorse Yukon. The conference will focus on practical and current Energy Solutions for commercial and institutional structures. It will also touch on transportation, residential housing and other energy issues.

The North has remote regions and different energy scenarios, weather trends and population bases, with energy issues requiring unique solutions. Together, we will learn the best practices and solutions for energy issues in the north.

What are the solutions that can be implemented now to conserve energy, reduce costs and limit GHG emissions? Delegates from Nunavut, Northwest and Yukon Territories and some southern regions will attempt to answer this question.

Date: February 15-19, 2010

Contact: Sean MacKinnon by e-mail at sean.mackinnon@gov.yk.ca or by phone (867) 393-7067.

Website: www.yukonenergyconference.ca

www.esc.gov.yk.ca

2. Ecological Encounters: *The Wildlife of Yukon's Arctic Tundra:*

Patterns and Trends in a Warming World

Sunday, February 28th, 2010, 3:30 pm- 5:00 pm
Yukon Wildlife Preserve (Free for members, \$15 for non-members)

Presented by **Dr. Don Reid of the Wildlife Conservation Society**, coordinator of the Arctic WOLVES (Wildlife Observatories Linking Vulnerable EcoSystems) project. Dr. Reid will illustrate patterns and trends from Arctic WOLVES observations and discuss what they might mean for the future of wildlife on Yukon's arctic fringe.

Ecological Encounters may be a combination of formal presentation and outdoor observations at the preserve. Dress for the weather.

Please pre-register by contacting either Chris Wilkinson, Program Officer, chris@yukonwildlife.ca or Clare Daitch, Program Manager, clare@yukonwildlife.ca. Phone: 867-456-7400

5. Pacific Climate Change Series: '*British Columbia's climate change adaptation strategy*', University of Victoria - February 17

Co-hosted by the **Pacific Institute for Climate Solutions (PICS)** and the **Pacific Climate Impacts Consortium (PCIC)**.

Ben Kangasniemi, A/Head of Science and Adaptation and other members of the Climate Action Secretariat will be presenting on: '**British Columbia's Climate Change Adaptation Strategy**' (to be launched in early February).

DATE: Wednesday, February 17, 2010

TIME: 2:00 - 3:00 pm

PLACE: Engineering and Computer Science Building (ECS) Rm 660,
University of Victoria

SPEAKER: Ben Kangasniemi, A/Head, Science and Adaptation, Climate
Action Secretariat, BC Ministry of Environment

TITLE: British Columbia's Climate Change Adaptation Strategy

All seminars will be available via live webcast at <http://www.pics.uvic.ca/broadcast.php>. The presenter's slides will be available online just before the seminar.

www.pics.uvic.ca

Articles

1. Melting Arctic Ice: What Satellite Images Don't See

By Michael D. Lemonik
Time
January 28, 2010

For scientists studying the health of Arctic sea ice, satellite observations are absolutely essential for providing the big picture. It was satellites that revealed in September 2007 a record minimum ice coverage in the region - the result of a massive summer melt. And it was satellites that showed in 2008 and 2009 the modest recovery of late-summer Arctic ice that suggested to some that the specter of a totally ice-free polar ocean might be somewhat less imminent than feared.

But those high-altitude observations need occasional reality checks from scientists down on the surface. It

was during one such on-the-ground research expedition last fall that David Barber, an Arctic climatologist at the University of Manitoba, got an unwelcome surprise. ([See pictures of the Arctic.](#))

Barber was aboard the Canadian research icebreaker *Amundsen*, checking on ice in the Beaufort Sea north of Alaska and Western Canada. The ship was well inside a region the satellites said should be choked with thick, multiyear-old ice. "That's pretty much a no-go zone for an icebreaker of the *Amundsen's* size," says Barber. But the ship kept going, at a brisk 13 knots - its top speed in open water is 13.7 knots - and even when it finally reached thick ice, he says, "we could still penetrate it easily."

In short, as Barber and his colleagues explain in a recent paper in *Geophysical Review Letters*, the analysis of what the satellites were seeing was wrong. Some of what satellites identified as thick, melt-resistant multiyear ice turned out to be, in Barber's words, "full of holes, like Swiss cheese. We haven't seen this sort of thing before." ([Read "Arctic Mystery: Identifying the Great Blob of Alaska."](#))

The findings add another wrinkle to a problem climate scientists have been warning about since the record melt of 2007: after each summer meltback, the Arctic Ocean refreezes completely in winter. The problem is that much of that refreezing creates a relatively thin layer of so-called first-year ice. "It's weaker than thick, multiyear ice," says University of Colorado scientist James Maslanik, "and less resistant to melting."

In 2008 and 2009, scientists feared the record-thin Arctic ice cover might melt away. But it didn't, because of unusually favorable ocean currents and weather patterns. "Early in the 2009 season it looked like we might be on the way to a record melt," says Julienne Stroeve, a research scientist at the National Snow and Ice Data Center, in Boulder, Colo., "but then winds spread the ice out, so the overall coverage ended up being greater than in 2007." Without those winds, in other words, 2009 might have set a new record for open water. But as it happened, ice cover in 2008 and 2009 rebounded significantly - but perhaps deceptively so. ([See pictures of the effects of global warming.](#))

What Barber's expedition further discovered was that some Arctic sea ice is not only whisper thin, but that even in places with thick ice, the ice was not as solid as satellites had indicated. That thick ice was still there, but largely as individual chunks covered with a veneer of new ice that masked their true nature. "It's significant and it's surprising," says Maslanik. "I wouldn't have expected that the ice would be as rotten and weak as what David Barber's team found."

This suggests that the analysis of satellite observations might be due for updating. "The algorithms we use to monitor ice extent were developed a long time ago," says Stroeve, "based on what 'typical' ice looked like at that time. We know there are errors with the measurements." The weakness in multiyear ice also suggests that if the unfavorable winds and currents that caused the 2007 meltback should recur, the Arctic Ocean could undergo another especially dramatic summer melt. Not just the first-year ice might go, but also some of the "rotten" multiyear ice that Barber encountered.

That in turn would trigger one of the many positive feedback mechanisms that could speed up the warming effects of greenhouse gases. Open ocean reflects less of the Sun's energy than ice does, so a large-scale summer melt would mean more absorption of heat in the ocean. The warmer ocean would heat the air above it, which would slow the refreezing of ice in winter, which would in turn become even more susceptible to melting in summer.

Exactly when a catastrophic melt might occur, however, is unpredictable. The long-term rise in global temperature as a result of greenhouse-gas emissions is overlaid with natural, year-to-year variability in all sorts of interconnected oceanic and atmospheric cycles that slow down warming down or speed it up temporarily. But because these variations tend to be cyclical, the "perfect storm" of conditions that caused the record 2007 melting - a situation Stroeve calls "unusual, but not unprecedented" - will probably return at some point. If they do, the Arctic could be primed for major, even irreversible, changes.

www.time.com

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2. Global warming threatens the Arctic charr

By Sara Coelho

Natural Environment Research Council

January 22, 2010

Arctic charr populations are falling throughout Britain and although part of the decline is due to specific local factors, scientists are now suggesting that global warming may also play a role. This is the first time that climate change has been linked to the decline of a fish species in Britain.

The Arctic charr (*Salvelinus alpinus*) is a trout-like cold-water fish common in Northern Europe, Russia and Canada. In Britain, already at the southernmost end of the species' distribution, they are restricted to deep lakes and lochs where water temperature stays under 15°C even in summer.

'They need cold water to survive and there are reasons to believe that climate change has a negative impact on this species,' says Dr Ian Winfield, from the Centre of Ecology & Hydrology, who compiled data surveyed in 11 locations in the Shetlands, Scotland, England and North Wales.

The team found that since 1990, ten of the 11 populations of Arctic charr have declined significantly. The only increase occurred in the Shetlands' Loch of Girsta, the northernmost surveyed site.

The decline of the Arctic charr is concerning as 'the species is listed as priority in the UK Biodiversity Action Plan and is already being affected by a wide range of problems,' he adds.

The species is particularly vulnerable to lake eutrophication, or undue fertilisation, that stimulates algal growth. 'The algae alone are not a problem,' says Winfield. 'But as they rot, the decomposition process consumes too much oxygen and the charr need well-oxygenated waters to survive.'

Other populations are threatened by competition with introduced fish such as the roach or an excessive number of cormorants that feed on charr.

But such local environmental factors alone do not explain the drop in Arctic charr numbers reported last week in *Hydrobiologia*. To figure out the possible effects of global warming on the species's numbers, Winfield and colleagues assigned an index of vulnerability to climate change to all surveyed locations. The vulnerability ranking depends on the lake's latitude, altitude and mean depth.

'The index was meant to predict how much water temperature of a given site is likely to change with global warming,' explains Winfield. Southern lakes at low altitude and with shallow waters have a high vulnerability and are more likely to get warmer than deep, mountainous lakes in the north.

Winfield found that the locations more vulnerable to climate change were also the sites where the Arctic charr declined the most. 'The index correlates very well with the population decrease observed since 1990,' says Winfield. This means that rising water temperatures might be playing a role in the species decline.

'This is the first time we see evidence of negative effects of climate change on a UK fish species,' he says, adding that more work needs to be done to understand the precise mechanisms involved in the decline.

The research was done in collaboration with the Environment Agency and Scottish Natural Heritage.

I.J. Winfield, J. Hateley, J.M. Fletcher, J.B. James, C.W. Bean and P. Clabburn. Population trends of Arctic charr (*Salvelinus alpinus*) in the UK: assessing the evidence for a widespread decline in response to climate change. *Hydrobiologia*. Published online: 11 January 2010. doi: 10.1007/s10750-009-0078-1

planetearth.nerc.ac.uk

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3. Inuit must adapt to climate change: study

By Geoff Nixon
CTV.ca News
January 30, 20

James Ford has spent eight years researching the effects of climate change on the lifestyles of Inuit people living in the Far North.

He's seen evidence that local temperatures are rising and there's a lot less sea ice floating around, for a much shorter time period each year. Along the Northern Foxe Basin, for example, the ice is taking as much as four weeks as long to freeze than it did 40 years ago, said Ford.

That means it is harder for Inuit people to hunt, fish, and eke out a livable existence, according to their traditional ways.

"Hunting is not just a hobby to Inuit, it's a way of life," the McGill University professor explained in a recent telephone interview from his Montreal office.

In places like Igloolik, Nunavut, where a week's worth of groceries typically cost more than \$550 for a small family, there simply aren't a lot of other options.

There are few jobs, many of Canada's 50,000 Inuit live well below the poverty line and there is little opportunity to change the available means of subsistence.

Ford likens the current circumstances for many Inuit to a community where the grocery store moves five kilometers away from your home every year, making it more and more difficult for you to get access to food, as time goes by.

And after enough time passes by, the road starts to crumble away and you're not even sure how to get there with the use of a car -- or in the case of the Inuit, possibly an ATV or a snowmobile.

For Inuit people, "their supermarket is the land," Ford said. The problem is that the supermarket is moving out of reach.

A way forward

In a new study published in the *Global Environmental Change* journal, Ford and a group of Canadian colleagues have concluded that Inuit must adapt to coming environmental changes that are inevitable and unavoidable.

Climate change, the researchers report, is threatening many aspects of Inuit life, including access to food, the integrity of local infrastructure and the ability to maintain their traditional lifestyles.

But according to Ford and his fellow researchers, things are not completely bleak.

"Despite the fact that our climate is changing, Inuit are adapting," Ford said.

Many Inuit are adapting to climate change on an individual basis through, for example, the use of new hunting techniques that employ modern technology. They are also paying attention to the fluctuations of wildlife populations and migration patterns and adjusting accordingly.

But the researchers contend that individual adaptation is not going to be good enough in the long run, and Inuit people will need government assistance to successfully maintain their lifestyles.

They are calling for all levels of government to work with Inuit communities, taking advantage of both scientific and traditional knowledge, to best develop strategies for dealing with climate change.

The cost for these investments is hard to gauge, as only a small number of researchers are involved in

studying Inuit adaptation to climate change and firm cost projections are not yet available.

"That is where the research is lacking," Ford admits.

And while some may assume that Ottawa has dropped the ball on a long-festering problem, Ford said the government has its eye on the situation.

Multimillion-dollar projects are underway with Indian and Northern Affairs, as well as Health Canada, seeking to gather "very, very practical" information about climate change and Inuit people, said Ford.

"The Feds, they are certainly getting up to speed on the adaptation side," he said.

At the Nunavut government level, studies are taking place to determine how climate change is affecting every aspect of Inuit life.

It's this type of progress that keeps Ford "guardedly optimistic" about the future.

"There still is a lot to do...but we're going in the right direction," he said.

www.ctv.ca

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4. Drilling project to reveal climate change in Antarctic

Indo Asian News Service

Yahoo News

January 29, 2010

Sydney, Jan 29 (IANS) The world's largest marine geoscience project is underway to drill deep beneath the Antarctic to discover clues to climate change.

That would involve boring through two km of rock in the sea bed, seven km deep in the ocean.

Rob McKay, post-doctoral fellow at Victoria University's Antarctic Research Centre, is aboard the Joides Resolution research ship bound for Wilkes Land, Antarctica.

McKay says the two-month expedition would help to understand the past climate history of the East Antarctic Ice Sheet.

'The project will essentially provide a snapshot of cooling and warming in the Antarctic from 34 million years ago to the present day and try to understand how these changes affected the global climate system, in particular the Southern Ocean.

'The East Antarctic Ice Sheet is the world's largest and we hope to collect rocks that are over 34 million years old. These will help document the onset of glaciation in Antarctica and the end of the greenhouse world when there were forests in Antarctica.'

The Integrated Ocean Drilling Programme (IODP) team set sail in early January from Wellington in New Zealand where the drilling ship docked after spending two months collecting core samples from sediments in the Canterbury Basin, a university release said.

'It's exciting to be part of a large collaborative project. The boat has an incredible set-up and the crew are highly experienced so the chances of a successful expedition are as high as possible,' said McKay.

in.news.yahoo.com

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5. Glacier-melting debate highlights importance of satellites

European Space Agency ESA
February 1, 2010

The intense public debate on how rapidly the Himalayan glaciers are retreating highlights the necessity for the constant monitoring of glaciers worldwide by satellites.

Since glaciers are among the most reliable indicators of climate change and because they can have a major influence on water availability, knowledge of the recent changes and future behaviour is of great interest for climate scientists and governing bodies. A key to assess these changes or to model their future evolution is the existence of a detailed glacier inventory.

Data from satellites allow scientists to measure glacier extent in detail, providing authoritative evidence of trends. They also allow local measurements to be expanded to a regional scale. Considering the valuable role satellites can play in determining the state of Earth's glaciers, the Global Climate Observing System (GCOS) has called for the systematic monitoring of glaciers by satellites in support of the UN Framework Convention on Climate Change.

In 2007, ESA started the GlobGlacier project as a major effort to develop and apply existing methodologies to monitor glaciers and contribute to a global glacier inventory using satellite observations. GlobGlacier, part of ESA's 'Data User Element', is adding about 20 000 of the estimated 160 000 glaciers worldwide to this inventory to allow their histories to be adequately tracked.

Kashmir, part of the Indian Himalayas, is one of the selected regions where little information is available on overall glacier extent or changes. GlobGlacier is creating inventory data for more than 1000 glaciers in this region.

The inventory combines information on glacier outlines based on archived satellite data from the Landsat Thematic Mapper (TM) and the Enhanced Thematic Mapper Plus (ETM+) instruments with topographic information from the Shuttle Radar Topography Mission and the Global Digital Elevation Model (GDEM) from ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer).

When a time series of suitable images are available for a certain region, changes in glacier length and extent can be calculated. "Such data allow scientists to assess the overall pattern of changes in a larger region for a better determination of climatic change impacts," said GlobGlacier Project Manager Frank Paul from the University of Zurich.

The above animation, based on data acquired by Landsat's TM on 15 November 1990 and by ETM+ on 1 August 2001, illustrates the changes in glacier extents that occurred during this time in the region northeast of the Gangotri Glacier, situated in Garwhal Himalaya.

While most of the smaller and debris-free glaciers show considerable retreat in this period, the larger glaciers with completely covered tongues have not changed much. Several of the pro-glacial lakes have grown. Quite a few glaciers at lower altitudes are nearly free of snow in the August 2001 image, indicating a retreat that year.

ESA's ERS-1, ERS-2 and Envisat Advanced Synthetic Aperture Radar (ASAR) data are providing velocity measurements of selected glaciers. The image to the right shows the surface velocity field for the Baltoro Glacier in Pakistan based on Envisat ASAR data from 2003 to 2008.

ESA's new Climate Change Initiative, which will produce robust long-term records of essential climate variables, will build on the results of the GlobGlacier project by further improving the algorithms for glacier monitoring and continually updating the related glacier inventory information.

www.esa.int

Feb 21, 2010 UNEP Press Release: [Understanding Glacier Melt : UNEP and WGMS report highlights global trends on glaciers and ice caps](#)

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6. Emissions of Potent Greenhouse Gas Increase Despite Reduction Efforts

By product of refrigerant chemicals remains in the atmosphere 300 years

NOAA

January 27, 2010

Despite a decade of efforts worldwide to curb its release into the atmosphere, NOAA and university scientists have measured increased emissions of a greenhouse gas that is thousands of times more efficient at trapping heat than carbon dioxide and persists in the atmosphere for nearly 300 years.

The substance HFC-23, or trifluoromethane, is a byproduct of chlorodifluoromethane, or HCFC-22, a refrigerant in air conditioners and refrigerators and a starting material for producing heat and chemical-resistant products, cables and coatings.

"Without the international effort to reduce emissions of HFC-23, its emissions and atmospheric abundance would have been even larger in recent years," said Stephen Montzka, a NOAA research chemist and lead author of the collaborative study between NOAA and university scientists. "As it was, emissions in 2006-2008 were about 50 percent above the 1990-2000 average."

The study, "Recent increases in global HFC-23 emissions," is scheduled to be published January 29 in *Geophysical Research Letters*.

HFC-23 is one of the most potent greenhouse gases emitted as a result of human activities. Over a 100-year time span, one pound of HFC-23 released into the atmosphere traps heat 14,800 times more effectively than one pound of carbon dioxide. To date, the total accumulated emission of HFC-23 is small relative to other greenhouse gases, making this gas a minor (less than one percent) contributor to climate change at present.

Because HFC-23 is such a potent greenhouse gas, the United Nations Framework Convention on Climate Change (UNFCCC) has facilitated the destruction of substantial quantities of HFC-23 in developing countries since 2003. The study by Montzka and colleagues shows for the first time that even with these actions HFC-23 emissions from developing countries remained substantial compared to recent years.

The Montreal Protocol, which is the international agreement that phases out ozone-depleting substances, requires the end of HCFC-22 production by 2020 in developed countries and 2030 in developing countries for uses that result in the HCFC-22 escaping to the atmosphere. This Protocol does not restrict HCFC-22 production in the synthesis of fluoropolymers or the HFC-23 that is co-produced. The future atmospheric abundance of HFC-23 and its contribution to future climate change depends on amounts of HCFC-22 produced and the success of programs to reduce emissions of the co-generated HFC-23.

Scientists measured air collected from above the snow surface and down to 380 feet below the snow surface during field studies in Antarctica in 2001, 2005 and 2009. Using these results, they were able to determine how amounts of HFC-23 and other gases affecting climate and stratospheric ozone have changed in the recent past. The first published measurements of HFC-23 appeared in 1998 but this was the first time scientists examined how HFC-23 emissions have changed since 1996, particularly in developing nations and since the UNFCCC's projects to reduce emissions began in 2003.

Monitoring changes in the atmospheric abundance of greenhouse gases and assessing their implications are essential for predicting and understanding climate change and represent important aspects of [NOAA's climate services](#). This study was supported in part by NOAA's Climate Program Office and the National Science Foundation.

7. Water vapour caused one-third of global warming in 1990s, study reveals

Experts say their research does not undermine the scientific consensus on man-made climate change, but call for 'closer examination' of the way computer models consider water vapour

By David Adam
The Guardian
January 29, 2010

Scientists have underestimated the role that water vapour plays in determining global temperature changes, according to a new study that could fuel further attacks on the science of climate change.

The research, led by one of the world's top climate scientists, suggests that almost one-third of the global warming recorded during the 1990s was due to an increase in water vapour in the high atmosphere, not human emissions of greenhouse gases. A subsequent decline in water vapour after 2000 could explain a recent slowdown in global temperature rise, the scientists add.

The experts say their research does not undermine the scientific consensus that emissions of greenhouse gases from human activity drive global warming, but they call for "closer examination" of the way climate computer models consider water vapour.

The new research comes at a difficult time for climate scientists, who have been forced to defend their predictions in the face of an embarrassing mistake in the 2007 report of the Intergovernmental Panel on Climate Change (IPCC), which included false claims that Himalayan glaciers could melt away by 2035. There has also been heavy criticism over the way climate scientists at the University of East Anglia apparently tried to prevent the release of data requested under Freedom of Information laws.

The new research, led by Susan Solomon, at the US National Oceanic and Atmospheric Administration, who co-chaired the 2007 IPCC report on the science of global warming, is published today in the journal *Science*, one of the most respected in the world.

Solomon said the new finding does not challenge the conclusion that human activity drives climate change. "Not to my mind it doesn't," she said. "It shows that we shouldn't over-interpret the results from a few years one way or another."

She would not comment on the mistake in the IPCC report - which was published in a separate section on likely impacts - or on calls for Rajendra Pachauri, the IPCC chairman, to step down.

"What I will say, is that this [new study] shows there are climate scientists round the world who are trying very hard to understand and to explain to people openly and honestly what has happened over the last decade."

The new study analysed water vapour in the stratosphere, about 10 miles up, where it acts as a potent greenhouse gas and traps heat at the Earth's surface.

Satellite measurements were used to show that water vapour levels in the stratosphere have dropped about 10% since 2000. When the scientists fed this change into a climate model, they found it could have reduced, by about 25% over the last decade, the amount of warming expected to be caused by carbon dioxide and other greenhouse gases.

They conclude: "The decline in stratospheric water vapour after 2000 should be expected to have significantly contributed to the flattening of the global warming trend in the last decade."

Solomon said: "We call this the 10, 10, 10 problem. A 10% drop in water vapour, 10 miles up has had an effect on global warming over the last 10 years." Until now, scientists have struggled to explain the temperature slowdown in the years since 2000, a problem climate sceptics have exploited.

The scientists also looked at the earlier period, from 1980 to 2000, though cautioned this was based on observations of the atmosphere made by a single weather balloon. They found likely increases in water vapour in the stratosphere, enough to enhance the rate of global warming by about 30% above what would have been expected.

"These findings show that stratospheric water vapour represents an important driver of decadal global surface climate change," the scientists say. They say it should lead to a "closer examination of the representation of stratospheric water vapour changes in climate models".

Solomon said it was not clear why the water vapour levels had swung up and down, but suggested it could be down to changes in sea surface temperature, which drives convection currents and can move air around in the high atmosphere.

She said it was not clear if the water vapour decrease after 2000 reflects a natural shift, or if it was a consequence of a warming world. If the latter is true, then more warming could see greater decreases in water vapour, acting as a negative feedback to apply the brakes on future temperature rise.

www.guardian.co.uk

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8. Pentagon to rank global warming as destabilising force

US defence review says military planners should factor climate change into long-term strategy

Susan Goldenberg
The Guardian
January 31, 2010

The Pentagon will for the first time rank global warming as a destabilising force, adding fuel to conflict and putting US troops at risk around the world, in a major strategy review to be presented to Congress tomorrow. The quadrennial defence review, prepared by the Pentagon to update Congress on its security vision, will direct military planners to keep track of the latest climate science, and to factor global warming into their long term strategic planning.

"While climate change alone does not cause conflict, it may act as an accelerant of instability or conflict, placing a burden on civilian institutions and militaries around the world," said a draft of the review seen by the Guardian.

Heatwaves and freak storms could put increasing demand on the US military to respond to humanitarian crises or natural disaster. But troops could feel the effects of climate change even more directly, the draft says.

More than 30 US bases are threatened by rising sea levels. It ordered the Pentagon to review the risks posed to installations, and to combat troops by a potential increase in severe heatwaves and fires. The review's release coincides with a sharpening focus in the American defence establishment about global warming - even though polls last week showed the public increasingly less concerned.

The CIA late last year established a centre to collect intelligence on climate change. Earlier this month, CIA officials sent emails to environmental experts in Washington seeking their views on climate change impacts around the world, and how the agency could keep tabs on what actions countries were taking to reduce greenhouse gas emissions.

The CIA has also restarted a programme - scrapped by George Bush - that allowed scientists and spies to share satellite images of glaciers and Arctic sea ice.

That suggests climate change is here to stay as a topic of concern for the Pentagon.

The Pentagon, in acknowledging the threat of global warming, will now have to factor climate change into

war game exercises and long-term security assessments of badly affected regions such as the Arctic, sub-Saharan Africa, and South Asia.

Military planners will have to factor climate change into war game exercises and long-term security assessments of badly affected regions such as the Arctic, sub-Saharan Africa, and South Asia.

"The leadership of the Pentagon has very strongly indicated that they do consider climate change to be a national security issue," said Christine Parthemore, an analyst at the Centre for a New American Security, who has been studying the Pentagon's evolving views on climate change. "They are considering climate change on a par with the political and economic factors as the key drivers that are shaping the world."

Awareness of climate change and its impact on threat levels and military capability had been slowly percolating through the ranks since 2008 when then Senators Hillary Clinton and John Warner pushed the Pentagon to look specifically at the impact of global warming in its next long-term review.

But the navy was already alive to the potential threat, with melting sea ice in the Arctic opening up a new security province. The changing chemistry of the oceans, because of global warming, is also playing havoc with submarine sonar, a report last year from the CNAS warned.

US soldiers and marines, meanwhile, were getting a hard lesson in the dangers of energy insecurity on the battlefield, where attacks on supply convoys in Afghanistan and Iraq inflicted heavy casualties.

"Our dependence on fuel adds significant cost and puts US soldiers and contractors at risk," said Dorothy Robyn, deputy undersecretary of defence for the environment. "Energy can be a matter of life and death and we have seen dramatically in Iraq and Afghanistan the cost of heavy reliance on fossil fuels."

She told a conference call on Friday the Pentagon would seek to cut greenhouse gas emissions from non-combat operations by 34% from 2008 levels by 2020, in line with similar cuts by the rest of the federal government.

In addition to the threat of global warming, she said the Pentagon was concerned that US military bases in America were vulnerable because of their reliance on the electric grid to cyber attack and overload in case of a natural disaster.

The US air force, in response, has built up America's biggest solar battery array in Nevada, and is testing jet fighter engines on biofuels. The Marine Corps may soon start drilling its own wells to eliminate the need to truck in bottled water in response to recommendations from a taskforce on reducing energy use in a war zone.

But not all defence department officials have got on board, and Parthemore said she believes it could take some time to truly change the military mindset.

Parthemore writes of an exchange on a department of defence list-serv in December 2008 about whether global warming exists. It ends with one official writing: "This is increasingly shrill and pedantic. Moreover, it's becoming boring."

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